

NEW PLANT DISCOVERIES FOR SONORAN ISLANDS, GULF OF CALIFORNIA, MEXICO

Benjamin T. Wilder

*Desert Laboratory
University of Arizona
1675 West Anklam Road, Tucson, Arizona 85745, U.S.A.
bwilder@email.arizona.edu*

Richard S. Felger

*University of Arizona Herbarium (ARIZ)
P.O. Box 210036, University of Arizona
Tucson, Arizona 85721, U.S.A.
rfelger@ag.arizona.edu*

Humberto Romero-Morales

*Tribu Seri, Punta Chueca
Sonora, MEXICO*

Adrián Quijada-Mascareñas

*Universidad Michoacana de San Nicolás de Hidalgo
Morelia, MEXICO*

ABSTRACT

Renewed botanical interest in the Sonoran islands of the Gulf of California (Islas Tiburón, San Esteban, San Pedro Nolasco, Dátil, and Alcatraz) as part of our project, "Botanical Diversity of Isla Tiburón and Satellite Islands, Gulf of California," has resulted in 61 new additions and distributional clarifications to the floras of these islands. These new records represent increases of 16% for Tiburón, 4% for San Esteban, 3.5% for San Pedro Nolasco, 3% for Dátil, and 12% for Alcatraz over the most recently published checklists. We also report three new records for the Sonora mainland. On Isla Tiburón the majority of the new additions are from the deep canyons and peaks of the extensive Sierra Kunkaak on the east side of the island, which highlight the sheltered habitats of the Sierra and their accordingly strong connection with more tropically inclined floras. For all islands, the new records expand our understanding of this region and represent intriguing distributional extensions for those species. The current floristic work on the Sonoran islands is significantly adding to the understanding of the biogeographical relations of these islands, as well as to their current status within a region facing increasing threats from development and invasive species.

RESUMEN

Un interés botánico renovado en las islas del Golfo de California en Sonora (Islas Tiburón, San Esteban, San Pedro Nolasco, Dátil, y Alcatraz), como parte del proyecto "Diversidad Botánica de Isla Tiburón e Islas Satélite en el Golfo de California", ha dado como resultado 61 nuevas adiciones a la flora de estas islas y varias clarificaciones sobre su distribución. Estos nuevos registros representan un aumento del 16% para Tiburón, 4% para San Esteban, 3% para Dátil, 12% para Alcatraz, y 3.5% para San Pedro Nolasco, sobre las listas florísticas más recientemente publicadas. Reportamos también tres nuevos registros para el territorio continental de Sonora. En Isla Tiburón la mayoría de los nuevos registros provienen de los cañones profundos y picos de la extensa zona de la Sierra Kunkaak, al este de la isla, lo que destaca los refugios de hábitat de la Sierra y su fuerte conexión con floras de afinidad tropical. Para todas las islas, los nuevos registros amplían nuestro conocimiento de esta región y representan notables extensiones en las distribuciones conocidas de esas especies. El presente trabajo florístico en las islas de Sonora añade información significativa sobre las relaciones biogeográficas de estas islas, así como su situación actual dentro de una región que se enfrenta a amenazas crecientes procedentes del desarrollo económico y de las especies invasoras.

INTRODUCTION

The Sonoran islands of the Gulf of California, in the Central Gulf Coast subdivision of the Sonoran Desert (Shreve 1951), support largely undisturbed, unique, and magnificent desert ecosystems. Scientific exploration focused on the flora and vegetation of the mainland and islands associated with the Gulf of California began with Edward Palmer's collections (Watson 1889). Principal works focusing on the islands include Johnston (1924), Gentry (1949), Felger and Lowe (1976), Case and Cody (1983), Felger and Moser (1985), Moran (1983), Turner et al. (1995), and Case et al. (2002). The most exhaustive works on the plants of the Gulf islands are: Johnston's (1924) classic work, produced from three months of collections, field observations, and subsequent herbarium studies; Gentry's (1949) evaluation and interpretations, based largely on Rempel's 1937 collections and Dawson's 1940 collections; Felger and Lowe's (1976) description and interpretation of the vegetation and flora of the Sonoran islands including a checklist; Case and Cody's *Island Biogeography in the Sea of Cortéz* (1983), and Case et al.'s *Island Biogeography of the Sea of Cortéz* (2002). Rebman et al. (2002)

and Moran and Rebman (2002) provide the most recent and comprehensive checklists of vascular plant species of the Gulf islands; it is upon these extensive checklists that we base the new records, clarifications, and interpretations presented here.

Recent field work on the Sonoran islands (Table 1), as part of our project “Botanical Diversity of Isla Tiburón and Satellite Islands”, has resulted in 48 new plant records and further study has yielded 13 distributional clarifications (Table 2). From largest to smallest, these islands are Tiburón, San Esteban, San Pedro Nolasco, Dátil, and Alcatraz (Figs. 1 and 2). The majority of these records (49) are from Isla Tiburón, representing a 16% increase over the 298 species reported in Rebman et al. (2002). Felger and Lowe (1976) predicted a 10–15% increase from their report of 286 species for this island. Similar predictions were made for the other islands treated here and are presented in Table 3 along with past and current species totals. While we report 61 distributional records, it is expected that about 15% the flora of Tiburón is still not known, the majority expected from canyons and high elevations of the Sierra Kunkaak, and further discoveries on other islands are likely especially when fieldwork is conducted in seasons with favorable rains (Table 3). Close to 10% of the new records reported here are non-native species, all occur on Isla Tiburón and two are also on Isla Alcatraz. West and Nabhan (2002) note the occurrence of the majority of the non-native species on the Midriff islands (islands found in the central part of the Gulf of California, between latitudes 29°40' and 28°20') and we provide specific details regarding localities, current status, and documentation with voucher specimens.

A number of biogeographical patterns are highlighted in the Sonoran island new records. One such connection is with “subtropical” areas. Species showing this pattern are supported by the extensive and relatively sheltered canyons in the Sierra Kunkaak of Isla Tiburón (Fig. 3A), where rainfall is presumably higher than the surrounding more xeric, desert areas. We report four species from the canyons of the Sierra Kunkaak whose nearest known populations are in both Baja California in the Sierra San Francisco ca 160 km to the southwest, and in Sonora in the subtropical canyons of the Sierra el Aguaje in the Guaymas region ca 150 km to the southeast: *Celtis reticulata*, *Lantana velutina*, *Notholaena lemmonii* var. *lemmonii*, and *Rhynchosia precatoria*. A relationship is also seen between Isla San Pedro Nolasco and the Sonoran Midriff islands, which are ca 130 km to the north. Two of the records; *Bothriochloa barbinodis* on San Esteban and *Chloris crinita* on Tiburón occur on no other Gulf islands besides San Pedro Nolasco, and *Notholaena lemmonii* var. *lemmonii* is only found on Isla Cerralvo in the southern Gulf besides on Tiburón and San Pedro Nolasco. This signal is reinforced by the fact that Tiburón and San Pedro Nolasco have a 68% floristic similarity. Another strong pattern is seen in species with distributions in the Baja California peninsula and the Sonoran mainland that we record for the Sonoran Midriff islands. We present new records for seven such taxa: *Ambrosia carduacea*, *Brahea armata/brandegeei*, *Dalea bicolor* var. *orcuttiana*, *Euphorbia xanti*, *Sideroxylon leucophyllum*, and *Tetramerium fruticosum* on Tiburón and *Ambrosia divaricata* on San Esteban. Taken together and with other taxa showing similar distributions and presence on the Midriff islands, evidence is mounting for plant migrations between the peninsula and mainland via the islands (Cody et al. 1983).

We treat each new record individually and note the significance of the record, the nearest population, the geographic range, and cite voucher specimen(s). Additional information for localities is in the gazetteer. Common names are given in the following order if known: Cmiique Iitom (Seri; in Roman font), local Spanish (*italics*), and English (Roman). Non-native species are denoted with an asterisk (*). Voucher specimens are deposited at the University of Arizona herbarium (ARIZ), unless indicated otherwise. Many of the duplicate specimens of our collections are variously deposited at MEXU, SD, and USON, as well as other herbaria in Mexico and the United States. We cite some specimens from Isla Alcatraz from the herbarium of the Prescott College Field Station at Bahía de Kino; photos of these specimens are at ARIZ and data based in SEINET. More detailed information for specimens at ARIZ can be accessed electronically via *Southwest Environmental Information Network* database (SEINET: <http://seinet.asu.edu/collections/selection.jsp>) and data for specimens at USON can be found at *Plantas Silvestres de Sonora: Un Herbario Electrónico en Línea, Catálogo de Especies* (<http://herbario.uson.mx:8080/plantson.htm>), and the cited herbarium collections. The majority

TABLE 1. Recent Sonoran Island fieldtrips by the authors.

Collector	Associated Collectors	Island	Locality	Dates	Collection Numbers	Number of New Records
Benjamin Wilder	Edward Gilbert, Humberto Romero	Tiburón	Eastern bajada, Pazj Hax waterhole (Tinaja Anita), north and central Sierra Kunkaak	29 Dec 2005– 4 Jan 2006	05-01–05- 54 and 06- 01–06-52	7
	David Bertelsen	Tiburón	Coralitos, Arroyo Sauzal, Xapij (Sauzal waterhole)	16–19 Mar 2006	06-54–06 -129	1
	Richard Felger, Humberto Romero	Tiburón	Eastern Bajada, Estero San Miguel, central Sierra Kunkaak	23–25 May 2006	06-143– 06-169	2
	Gloria Guadalupe Morales-Figueroa, Jesús Sanchez Escalante, Mikhal Gold, Humberto Romero	Tiburón	Estero San Miguel	2 Sep 2006	06-274– 06-288	0
	Richard Felger, Edward Gilbert, Humberto Romero	Tiburón	Northern Sierra Kunkaak canyons, Zozni Cmiipla	23–26 Nov 2006	06-345–22 06-513	2
	Seth Turner	San Esteban	Arroyo Limantour, Central peak, south- west corner	7–9 Mar 2007	07-38–07-93	3
	Seth Turner	Dátil	Central peak and canyon	10–11 Mar 2007	07-94– 07-142	3
	Exequiel Ezcurra, Richard Felger, Jesús Ventura Trejo	Tiburón	Ensenada de Perros	12 Apr 2007	07-143– 07-165	0
	Exequiel Ezcurra, Richard Felger, Jesús Ventura Trejo	Dátil	Central eastern canyon	12 Apr 2007	07-166– 07-183	0
	Humberto Romero, Seth Turner	Tiburón	Estero San Miguel, Sopc Hax waterhole, rancho Carocol, northern portion of eastern bajada, Tecomate	1–5 May 2007	07-184– 07-272	3
Adrián Quijada- Mascareñas		Tiburón	Cerro San Miguel	9 Nov 1990	90T002-90T012	2
	Gil Gillenwater	Tiburón	Cerro San Miguel	9 Mar 1991	91T007-90T017	2
Richard Felger	Alberto Búrquez Montijo, Florencio Cota Moreno, Jesús Ventura Trejo	San Pedro Nolasco	Northeast side of island	28 Nov 2006	06-73–06-107	1

of the records introduced here were obtained during Felger and Wilder's fieldwork from 2005 to 2007 and Quijada's field work in 1990 and 1991 (Table 1). However, some records were discovered while searching herbarium specimens, and dates of collection are given for those specimens.

TABLE 2. New records for the Sonoran islands in the Gulf of California. New is defined as not included in the checklist of Rebman et al. (2002). **Bold** = New for the island. * = Non-native species. j = Previously cited but not by Rebman et al. 2002.

Family	Species	Tiburón	San Esteban	Nolasco	Dátil	Alcatraz
Acanthaceae	<i>Tetramerium fruticosum</i>	TIB				
Amaranthaceae	<i>Suaeda esteroa</i>	TIB				
Apocynaceae	<i>Funastrum cynanchoides</i> var. <i>hartwegii</i>	TIB				
Arecaceae	j <i>Brahea armata</i>	TIB				
Asteraceae	<i>Ambrosia carduacea</i>	TIB				
Asteraceae	<i>Ambrosia divaricata</i>	TIB	EST		DAT	
Asteraceae	<i>Gymnosperma glutinosum</i>	TIB				
Asteraceae	<i>Heliopsis anomala</i>	TIB				
Asteraceae	<i>Pectis papposa</i> var. <i>papposa</i>	TIB				ALC
Asteraceae	<i>Xylothamnia diffusa</i>	TIB				ALC
Bataceae	<i>Batis maritima</i>	TIB				ALC
Bixaceae	j <i>Amoreuxia palmatifida</i>	TIB				
Convolvulaceae	<i>Cuscuta americana</i>	TIB				
Convolvulaceae	<i>Cuscuta desmouliniana</i>	TIB				
Convolvulaceae	j <i>Ipomoea hederacea</i>	TIB				
Convolvulaceae	<i>Jacquemontia agrestis</i>	TIB				
Cucurbitaceae	<i>Tumamoca macdougallii</i>	TIB				
Cymodaceae	j <i>Halodule wrightii</i>	TIB				
Cyperaceae	j <i>Cyperus elegans</i>	TIB		NOL		
Cyperaceae	<i>Cyperus squarrosus</i>			NOL		
Euphorbiaceae	<i>Euphorbia abramsiana</i>	TIB				
Euphorbiaceae	j <i>Euphorbia arizonica</i>	TIB				
Euphorbiaceae	<i>Euphorbia eriantha</i>	TIB			DAT	
Euphorbiaceae	<i>Euphorbia prostrata</i>	TIB				
Euphorbiaceae	<i>Euphorbia xanti</i>	TIB				
Fabaceae	<i>Dalea bicolor</i> var. <i>orcuttiana</i>	TIB				
Fabaceae	<i>Desmodium procumbens</i>	TIB				
Fabaceae	* <i>Pithecellobium dulce</i>	TIB				
Fabaceae	<i>Rhynchosia precatoria</i>	TIB				
Fabaceae	<i>Tephrosia vicioides</i>	TIB				
Hydrophyllaceae	<i>Phacelia affinis</i>	TIB				
Malpighiaceae	<i>Echinopterys eglanulosa</i>	TIB				
Malvaceae	j <i>Abutilon palmeri</i>	TIB				
Malvaceae	<i>Horsfordia newberryi</i>	TIB	EST		DAT	
Myrtaceae	* <i>Eucalyptus camaldulensis</i>	TIB				
Orobanchaceae	<i>Orobanche cooperi</i>	TIB				
Poaceae	j <i>Aristida californica</i> var. <i>glabarata</i>	TIB				
Poaceae	<i>Bothriochloa barbinodis</i>		EST			
Poaceae	j* <i>Cenchrus echinatus</i>	TIB				
Poaceae	<i>Chloris crinita</i>	TIB				
Poaceae	<i>Chloris virgata</i>	TIB				
Poaceae	<i>Enneapogon desvauxii</i>	TIB				
Poaceae	<i>Leptochloa dubia</i>	TIB				
Poaceae	j* <i>Pennisetum ciliare</i>	TIB				ALC
Poaceae	j <i>Setaria leucopila</i>	TIB	EST		DAT	
Poaceae	j <i>Sporobolus virginicus</i>	TIB				ALC
Poaceae	<i>Tridens muticus</i> var. <i>muticus</i>	TIB				
Poaceae	<i>Urochloa fusca</i>	TIB	EST			
Portulacaceae	<i>Portulaca oleracea</i>	TIB				
Pteridaceae	<i>Notholaena californica</i> ssp. <i>californica</i>	TIB	EST			
Pteridaceae	<i>Notholaena lemmonii</i> var. <i>lemmonii</i>	TIB				
Pteridaceae	<i>Notholaena standleyi</i>	TIB				

TABLE 2. continued

Family	Species	Tiburón	San Esteban	Nolasco	Dátil	Alcatraz
Rubiaceae	<i>Galium proliferum</i>	TIB				
Rubiaceae	<i>Galium stellatum</i> var. <i>eremicum</i>		EST			
Sapotaceae	<i>Sideroxylon leucophyllum</i>	TIB	EST			
Solanaceae	<i>Lycium berlandieri</i> var. <i>longistylum</i>	TIB				
Solanaceae	<i>Physalis crassifolia</i> var. <i>versicolor</i>	TIB			DAT	
Tamaricaceae	†* <i>Tamarix aphylla</i>	TIB				
Ulmaceae	<i>Celtis reticulata</i>	TIB				
Verbenaceae	<i>Lantana velutina</i>	TIB				
Zygophyllaceae	* <i>Tribulus terrestris</i>	TIB				ALC

NEW RECORDS

ACANTHACEAE**Tetramerium fruticosum** Brandegee

New for Tiburón where it is common in deep, protected canyons in the interior of the Sierra Kunkaak. Herbaceous perennials.

Geographic Range.—Widespread in Baja California Sur (Daniel 1997) and known from mainland Sonora (Tinaja Picu, SW of Pitiquito; Daniel 1986, 2004) by a single collection (Wiggins 6055, DS). The Tiburón specimens provide a disjunct, stepping-stone locality.

Tiburón.—Base of Sierra Kunkaak, between Sierra Kunkaak Mayor and Sierra Kunkaak Segundo, head of arroyo, Wilder 05-46. Base of canyon on N slope of Sierra Kunkaak, Wilder 06-386. Siimen Hax waterhole, Wilder 06-449.

AMARANTHACEAE**Suaeda esteroa** Ferren & S.A. Whitmore. Sipjö yanéaax; estuary seablite

We confirm the presence of this species on Tiburón. We expected and found it at the margins of mangroves at Estero San Miguel, where it is often inundated by the highest tides. The nearest populations are on the opposite shore of the Canal del Infiernillo. This species and *S. nigra* (Raf.) J.F. Macbr. are the only *Suaeda* species on Tiburón, although others are reported (e.g., Moran 1983a; Rebman et al. 2002). Halophytic succulents.

Geographic Range.—Mangrove and salt scrub esteros in the Gulf of California and Pacific coast of the Californias. The Gulf of California plants are annuals and perhaps a different taxon from those on the Pacific Coast, which generally are perennials.

Tiburón.—Zozni Cmiipla, Wilder 06-362.

APOCYNACEAE**Funastrum cynanchoides** (Decne.) Schltr. var. **hartwegii** (Vail) Krings [*Sarcostemma cynanchoides* Decne. subsp. *hartwegii* (Vail) R.W. Holm; *Funastrum heterophyllum* (Engelm.) Standl.] Hexe; huirote, hierba lechosa; climbing milkweed

New for Tiburón, where we found it in a canyon bottom among dense vegetation near a waterhole in the Sierra Kunkaak. It is widespread and common on the adjacent Sonora mainland and it is surprising that we have only one record for it on the island. Perennial vines, the stems dying back during drought. Flowering at various seasons.

Geographic Range.—SW United States to Michoacán and Queretero, and northern Baja California.

Tiburón.—Pazj Hax waterhole, wet soil, Wilder 06-10.

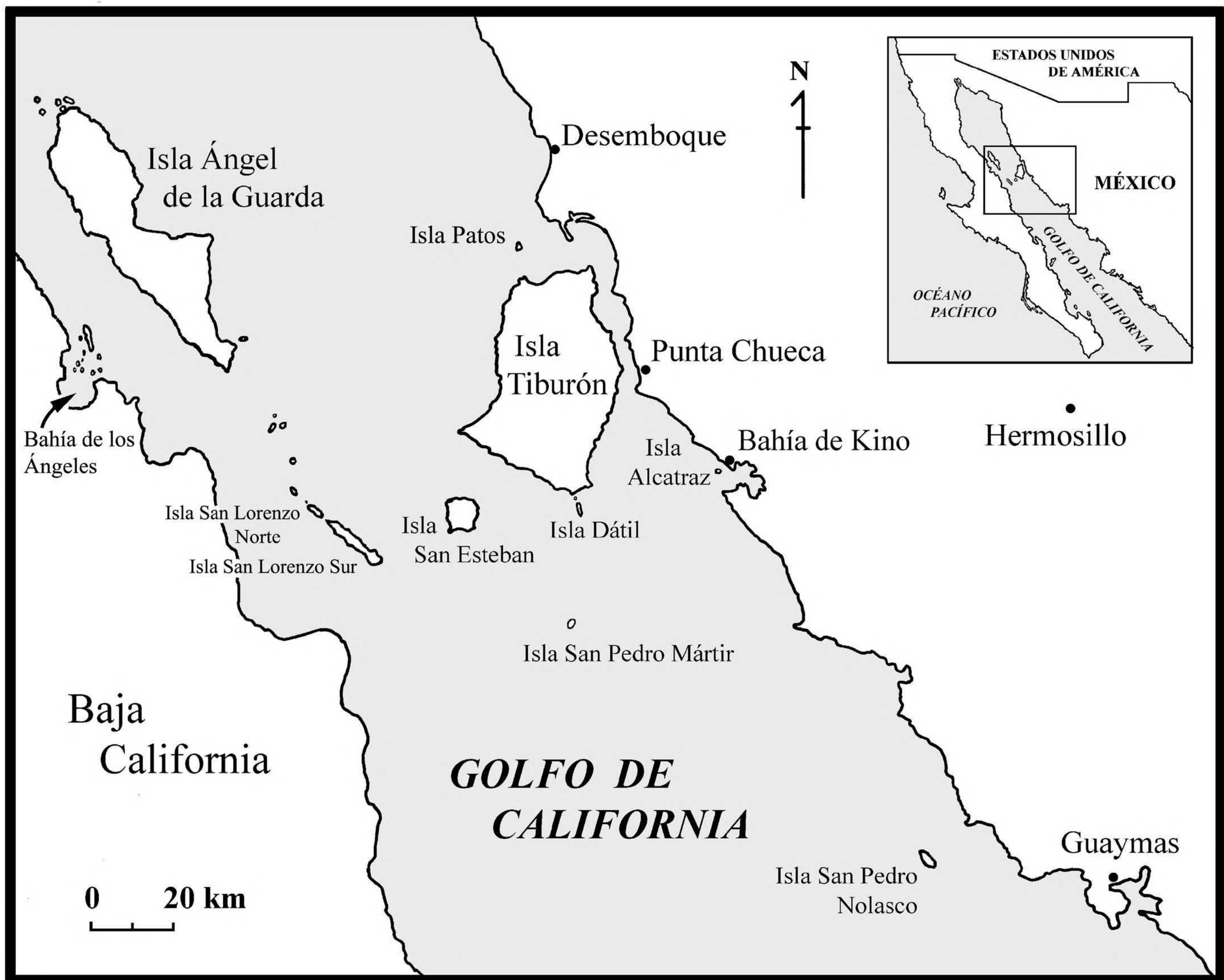


FIG. 1. Midriff island region. Map by Cathy Moser Marlett.

ARECACEAE

Brahea armata S. Watson. Zamij cmaam (female palm); *palma azul*; blue hesper palm

The report of a palm on Isla Tiburón had been enigmatic even though a number of Comcáac have known of a palm on the northwest side of the island (Felger & Moser 1985, p. 351). We now document this report with a specimen and additional information. On May 20, 1964, José Juan Moreno brought Mary Beck Moser a single leaf of a palm that he collected in a canyon along the northwest side of the island. Sr. Moreno had been on a fishing trip and knew that Mary Beck and Richard Felger were interested in the “palm from Tiburón” as they were beginning their studies of Seri knowledge and uses of the plant world. Soon thereafter Richard and Alexander “Ike” Russell made a number of searches by airplane along the west side of the island for the elusive palm. The search was futile even though Ike would fly low and close enough that Richard usually could identify all but the smaller plants (Felger 2000a, 2002). Sometimes, however, shadows, other trees, and cliffs can make it difficult for plant spotting from the air. On May 4, 2007, Humberto confirmed that he had seen a single palm at this site about 20 years earlier.

Additional information from R. James Hills (pers. comm., April 2007) further substantiates the presence of one or more palms on the island. The site is reported to be at or near a fresh water source in a canyon on the seaward side and base of high cliffs on the northwest side of the extremely arid Sierra Menor. However, on a trip to the claimed canyon in September 2007 by Felger, Romero, and Wilder, no palm was found and we believe the lone individual is now deceased.

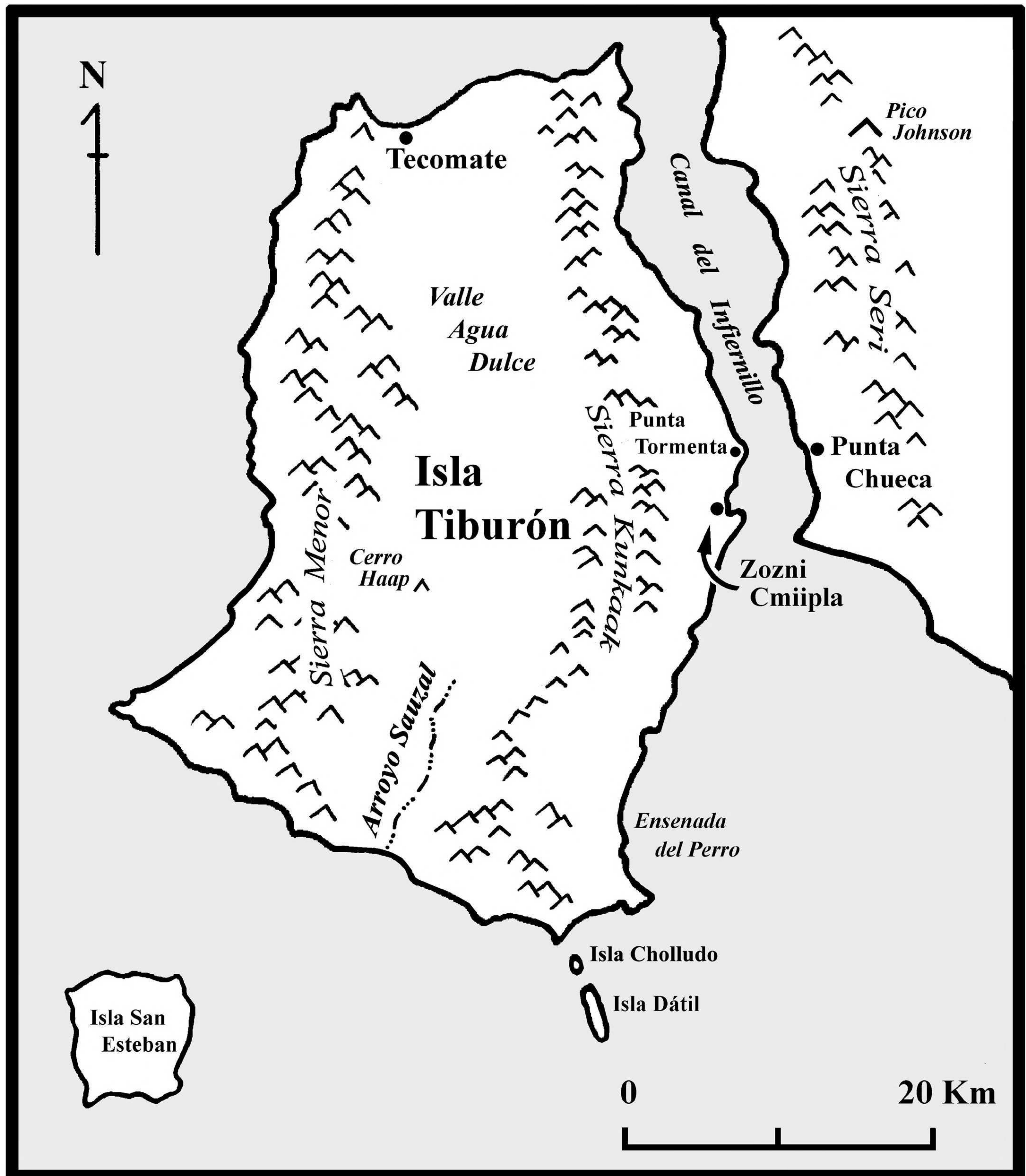


FIG. 2. Isla Tiburón and vicinity. Map by Cathy Moser Marlett.

Geographic Range.—The nearest locality for *B. armata* is at the SE side of Isla Ángel de la Guarda (Johnston 1924; Moran 1983b; Turner et al. 1995), ca 65 km to the W of the Tiburón site. The vegetation and habitats of the Isla Ángel palm canyon sites and the NW coast of Tiburón are quite similar. The nearest *Brahea* population from the Tiburón site is on the Sonora mainland about 37.5 km to the NE: “The most isolated and undoubtedly smallest palm population in Sonora occurs on a north-facing slope below Pico de Johnson in the Sierra Seri. There are probably fewer than one dozen of these palms, hidden from view and far from any road” (Felger & Joyal 1999, p. 10). The population on Pico de Johnson seems conspecific

TABLE 3. Island flora totals and predictions for additional records. A = Felger and Lowe 1976, B = Moran 1983, C = Rebman et al. 2002, D = Our current information.

Islands	A		B		D	
	# Species	Prediction	# Species	# Species	# Species	Prediction
Tiburón	286	315-329	298	298	340	391 (+15%)
San Esteban	107	118	117	123	125	131 (+5%)
San Pedro Nolasco	55	NA	56	57	57	57
Dátil	99	NA	99	99	106	111 (+5%)
Alcatraz	43	NA	43	43	44	46 (+5%)

with the hesper palms in the Sierra el Aguaje, N of San Carlos and Guaymas, which have been treated as conspecific with *B. brandegeei* (Purpus) H.E. Moore of Baja California Sur (Felger & Joyal 1999; Felger et al. 2001; Henderson et al. 1995). These western Sonora populations, however, appear to be closely related to *B. armata* of Baja California Norte and Isla Ángel de la Guarda and the distinctions “have not been quantified or studied in depth” (Felger & Joyal 1999, p. 11).

Tiburón.—Canyon on NW side of the island, 20 May 1964, José Juan Moreno, s.n.

ASTERACEAE

Ambrosia carduacea (Greene) W.W. Payne

New for Tiburón. It is a fairly common component along the drainageways of the rich canyon desertscrub/thornscrub community of the Sierra Kunkaak (Fig. 4A), especially east- and north-facing canyons. It also a new record for western mainland Sonora, where it occurs on the north facing slopes of Pico de Johnson on the Sonora mainland opposite Tiburón. Robust shrubs ca 1—2.5 m tall; reproductive October to at least February.

Geographic Range.—Widespread in both states of Baja California and on Isla Cerralvo, mostly in Sonoran desertscrub and extending into tropical deciduous forest in the Cape Region. Widely disjunct in E-central Sonora where it is often arborescent to 4 (5) m tall. The new records for Sierra Kunkaak and Sierra Seri narrow the gaps between the Baja California peninsula and the disjunct Sonora populations along the E side of the desert as mapped by Turner et al. (1995).

Tiburón.—Top of San Miguel Peak in a sheltered canyon, 28 Oct 1979, Knight 1019 et al. (UNM). Cerro San Miguel near Sierra Kunkaak, upper bajada, 1 m tall, Quijada-Mascareñas 90T007. Head of an arroyo at base of Sierra Kunkaak, between Sierra Kunkaak Mayor and Sierra Kunkaak Segundo, 1,285 ft, Wilder 05-26. Head of an arroyo at E base of Sierra Kunkaak, 875 ft, Wilder 06-31.

Sonora mainland.—N side of Pico de Johnson, Sierra Seri, 30 Dec 1991, Powell B. (Gil) Gillenwater III (photo).

Ambrosia divaricata (Brandege) W.W. Payne. An icoquéete; *chicurilla*, *huizapol*

New for San Esteban. The nearest populations are on Tiburón and Dátil where it is fairly widespread as shrubs to ca 1 m in height. On San Esteban we know it only from the tall central peak where it is localized as a dwarf shrub tucked into the north-facing slope of the ridge.

Geographic Range.—Primarily a Baja California peninsular species with outlying populations along the Sonora coast and Gulf islands.

San Esteban.—Central peak, 365 m, steep slopes of ridge top, dwarf shrubs ca 20 cm tall, Wilder 07-59.

Gymnosperma glutinosum (Spreng.) Less. Gumhead

New for Tiburón, where we found a few plants along the bottom of a canyon in the Sierra Kunkaak. The nearest populations are on the Sonoran mainland where it occurs in scattered localities from the Guaymas region northward (Felger 1999, 2000b). Small shrubs or subshrubs.

Geographic Range.—Arizona and Texas to Guatemala.

Tiburón.—Base of N portion of Sierra Kunkaak, ca 0.5 km E of Siimen Hax waterhole, 360 m, broad canyon bottom, subshrub, stems water swept [from a flash flood], *Wilder 06-467*.

Heliopsis anomala (M.E. Jones) B.L. Turner [*H. parvifolia* A. Gray var. *rubra* (T.R. Fisher) Wiggins]

New for Tiburón; growing in deep canyons of the Sierra Kunkaak where it is localized, usually in shaded places, often among rocks, and occasionally along open washes of canyon drainages. The nearest population occurs in similar habitat in the Sierra Seri. Mostly perennials, probably short lived, and also flowering in the first year or season.

Geographic Range.—W Sonora from the Sierra Bacha (S of Puerto Libertad) to the Guaymas region, and both Baja California states.

Tiburón.—Head of an arroyo at E base of Sierra Kunkaak, *Wilder 06-32*. Canyon bottom at N base of Sierra Kunkaak, *Wilder 06-411*.

Pectis papposa Harv. & A. Gray var. **papposa**. Caasol heecto, caasol ihasíi quiipe, cacáataj; *mansanilla del coyote*; desert chinchweed

New for Alcatraz; widespread and common on adjacent mainland and Tiburón. Aromatic hot-weather ephemerals.

Geographic Range.—Aridlands of W North America.

Alcatraz.—25 Oct 2001, *Jones 16* (Prescott College Collection).

Xylothamnia diffusa (Benth.) G.L. Nesom. Caasol cacat, caasol ziix iic cöihíipe; *hierba de pasmo*

New for Alcatraz; common on the adjacent mainland and on parts of coastal Tiburón. Small shrubs.

Geographic Range.—Coastal Sonora from the vicinity of Bahía de Kino to NW Sinaloa, Baja California Norte y Sur, and Islas Ángel de la Guarda and San Lorenzo.

Alcatraz.—2 May 2002, *Gracida 56* (Prescott College Collection).

BATACEAE

Batis maritima L. Pajóocsim, xpajóocsim, xpacóocsim; *dedito*; saltwort

New for Alcatraz; common in adjacent mainland and Tiburón coastal wetlands. Halophytic succulent perennials locally forming dense ground cover of trailing and scrambling stems.

Geographic Range.—Shores of the Americas including the Gulf of California.

Alcatraz.—27 May 2002, *Gracida 77* (Prescott College Collection).

BIXACEAE

Amoreuxia palmatifida Sessé & Moç. ex DC. Xoját; *saiya*

Although reported for Tiburón by Felger and Moser (1985), we verify its occurrence here with a specimen from the middle of the island. The roots were an important food resource for the Seris. Perennials from a thick, tuberous root, responding to summer rains and dormant during the rest of the year. It also occurs on the adjacent Sonora mainland.

Geographic Range.—S-central Arizona and Sonora to Colombia, and Baja California Sur, the closest peninsular location is in the Sierra San Francisco.

Tiburón.—Haap Hill, 8 Sep 1974, *Felger T74-2*.

CONVOLVULACEAE

Cuscuta americana L. Hamt itóozj; *fideo*; dodder

New for Tiburón and the first record for a Gulf island. The nearest known localities in Sonora are in the San Carlos-Guaymas region ca 160 km to the southeast; it is widespread elsewhere in Sonora in non-desert regions. Stems moderately thick; on various woody shrubs, especially *Colubrina viridis* M.E. Jones. Specimens of both *Cuscuta* were identified by Mihai Costea in 2007.

Geographic Range.—Florida; Mexico to South America and the West Indies.



FIG. 3. Sierra Kunkaak. (A, top) Sheltered, interior canyon, ca 0.5 km up canyon from Siimen Hax waterhole. (B, bottom) *Sideroxylon leucophyllum* on talus slope on north side of Cerro San Miguel. Photos by Benjamin Wilder, 25 Nov 2006.



FIG. 4. New records from Sierra Kunkaak. (A, top left) *Ambrosia carduacea* (Wilder 06-383). (B, bottom) *Euphorbia xanti* (Wilder 06-453). (C, top right) *Echinopterys eglandulosa* (Wilder 06-377). Photos by Benjamin Wilder.

Tiburón.—Foothills of NE portion of Sierra Kunkaak, *Wilder 06-373*. Top of Sierra Kunkaak Segundo, *Wilder 06-495*.

Cuscuta desmouliniana Yunck. Hamt itóozj; *fideo*; dodder

New for *Tiburón* and the first record for a Gulf island. Widespread on the island and common on the adjacent Sonora mainland. Stems very slender; on various annuals.

Geographic Range.—Widespread in W and central Sonora and on the Baja California peninsula.

Tiburón.—SE side of Agua Dulce Valley, ca 12 mi S from Tecomate, ca 280 m, 11 Dec 1976, *Felger 76-T14*. NE base of Sierra Kunkaak, “bench” above arroyo bottom, *Wilder 06-381*.

Ipomoea hederacea Jacq. Hatáaij; *trompillo azul*; morning glory

An unidentified *Ipomoea* reported for *Tiburón* (Moran 1983a; Rebman et al. 2002) is undoubtedly this species, which is the only one known for the island. It is locally common at widely separated localities on the island and may be seasonally more widespread. Warm weather ephemeral vines.

Geographic Range.—Widespread in the Sonoran Desert including western Sonora and Baja California Sur with the closest peninsular location being the Sierra San Francisco. North and South America and adventive in the Old World.

Tiburón.—Haap Hill, 11 Dec 1976, *Felger 76-T23*. Vicinity of Zozni Cmiipla, *Wilder 06-349*.

Jacquemontia agrestis (Mart. ex Choisy) Meisn. [*J. palmeri* S. Watson, Proc. Amer. Acad. Arts 24:63. 1889]

New for *Tiburón*, where it was found in the interior of the island, and new for islands in the Gulf of California. There are a number of records for this species to the east and south of the Sonoran Desert in Sonora but it is apparently rare or poorly known from the desert. Despite more than a century of intensive collecting in the Guaymas region, it has not been recorded there since Palmer’s collection in 1887 (Watson 1889). In Arizona it is known only from the Baboquivari Mountains where it has not been recorded since 1945 (Austin 1998). Is its range shrinking in the Sonoran Desert region? Or has it been overlooked? Annuals, generally vining but the *Tiburón* specimens are stunted summer/fall ephemerals and not vining.

Geographic Range.—Arizona through Mexico, uncommon in Baja California Sur (present in the Sierra San Francisco), to Honduras and South America; often a vining weed in cultivated fields.

Tiburón.—Haap Hill, 11 Dec 1976, *Felger 76-T24*.

CUCURBITACEAE

Tumamoca macdougalii Rose. Hatoj caaihjö (“that which makes the eyes red”; Felger & Moser 1991, p. 388; Moser & Marlett 2005); Tumamoc globe-berry

New documentation for *Tiburón* and a new generic record for the Gulf islands. Perennials with a single tuberous root, producing a small, ephemeral vine following summer/fall rains. The small fruit is bright red. The Comcáac know of it on the east side of *Tiburón*. Paul Knight’s collection is from the general vicinity of Punta Tormenta on the east shore of the island. The nearest known populations are in the vicinity of Bahía de Kino.

Geographic Range.—SW and central Sonora to S-central Arizona.

Tiburón.—Growing near the beach, under *Frankenia palmeri*, single seed per fruit, 24 Oct 1979, *Knight 909 et al* (UNM). Punta Tormenta, 14 Sep 2007, *Romero 07-19*.

CYMODACEAE

Halodule wrightii Asch. Shoal grass

New listing for *Tiburón*, although reported for the Canal del Infiernillo in shallow sea water (15—150 cm below low tide level (Felger 2004; McMillan & Phillips 1979; Meling-López & Ibarra-Obando 1999). Richard observed *Halodule* in the stomachs of sea turtles (*Chelonia*) butchered by Seris along the Infiernillo coast of *Tiburón* and at Punta Chueca in the 1970s and 1980s, but only recently realized that at least much of it was *Halodule* rather than *Ruppia* as documented by the specimen cited below. At that time (1970s and 1980s) large

and small fragments of *Ruppia maritima* L. were common in the summertime coastal and beach drift along both coasts of the Infiernillo but the source of rooted plants may have been further south in the Estero de la Cruz at Bahía de Kino (Alf Meling-López, pers. comm., 2006). *Halodule* is a small, delicate seagrass locally known only from the summer months when the common local seagrass *Zostera marina* L. is not present. (Felger & Moser 1985; Meling-López & Ibarra-Obando 1999; Torre 2002.)

Geographic Range.—Shallow, protected sea water; intermittently on the Pacific coast from Canal del Infiernillo, Sonora, and Sinaloa to Central America, and Atlantic waters from southeastern United States to South America and the West Indies.

Canal del Infiernillo.—S end of Infiernillo Channel, S of Punta Chueca, water 26°C, recovered from stomach content of a *Chelonia mydas* harpooned and butchered at Punta Chueca, stomach full, ca 99% comprised of this seagrass, 16 Oct 1973, *Felger 21205 et al.* Punta Chueca, water depth of 6 in. to 1.5 m, 16°C, 5-7 Jan 1979, *Ronald Phillips & Calvin McMillan s.n.* Ca. 2 km N of Punta Chueca, 25 Jul 2007, *Wilder 07-370.*

CYPERACEAE

Cyperus elegans L. Sticky sedge

Documented for Isla San Pedro Nolasco by Gentry (1949) but not included in subsequent checklists. The nearest populations are at waterholes and other wetland sites on the opposite mainland and it also occurs at waterholes on Tiburón. The Nolasco record is enigmatic because there are no wetland habitats on the island, although on occasion, following favorable rains, the steep, north-facing canyon-slopes on the east side of the island can be lush and grassy (Felger & Lowe 1976). The plants are notably viscid, even the spikelets, and birds are presumed dispersers. It has not been documented on the island since 1940, in spite of Richard's several extensive collecting trips and visits by other botanists. Annuals in western Sonora (elsewhere perennials).

Geographic Range.—S United States and Baja California Sur to South America.

San Pedro Nolasco.—6 Feb. 1940, *Dawson 1036* (LCU, NY; verified by Gordon Tucker, pers. comm., 2007, also see Tucker 1994).

Cyperus squarrosus L. [*C. aristatus* Rottb.]. Dwarf sedge

New for Nolasco. Documented from a few other islands in the Gulf (San Pedro Martír and Espíritu Santo) and we predict it will be found on other larger islands. Diminutive, short-lived annuals.

Geographic Range.—Cosmopolitan and widespread in the Sonoran Desert, including Baja California Norte y Sur and present in the Sierra San Francisco.

San Pedro Nolasco.—NE side of island, ca 60 m, open area near canyon bottom, E-facing exposure in local area mostly free of *Vaseyanthus* with *Boerhavia*, *Coreocarpus*, *Eragrostis pectinacea*, *Setaria liebmannii*, localized population of several hundred plants, *Felger 06-87.*

EUPHORBIACEAE

Euphorbia abramsiana L.C. Wheeler

New for Tiburón and not recorded for other Gulf islands except Isla San José off Baja California Sur. Known from widely separated localities in western Sonora. Annuals, mostly growing with summer-fall rains.

Geographic Range.—SE California to Baja California Sur and S Arizona to Sinaloa.

Tiburón.—Near airstrip [= Palo Fierro landing field at Punta Tormenta], 25 Oct 1979, *Knight 906 et al.* (UNM).

Euphorbia arizonica Engelm. Tomítom hant cocpéetij; *golondrina*; Arizona spurge

This species was listed by Felger and Lowe (1976) and Moran (1983a) for Tiburón but not by Rebman et al. (2002). We confirm the earlier listings with specimens from six localities. Non-seasonal ephemerals to small perennials.

Geographic Range.—SW United States and NW Mexico including both Baja California states.

Tiburón.—SW part of Central Valley, ca 13 mi S of Tecamate, upper rocky slope of mountain bordering

valley, 1200-1400 ft, S facing slope, 2 Feb 1965, *Felger 12423*. Haap Hill, 8 Sep 1974, *Felger 74-T40*. Between Sopc Hax water hole and Hant Hax camp, 26 Oct 1963, *Felger 9339*. Cerro San Miguel, *Quijada-Mascareñas 91T005*. Large arroyo heading to a valley at E base of Sierra Kunkaak, *Wilder 06-52*. Siimen Hax waterhole, *Wilder 448*.

Euphorbia eriantha Benth. Pteept; beetle spurge

New for Dátil; widespread on nearby Tiburón. Non-seasonal annuals.

Geographic Range.—Southwestern United States, northern Mexico, and Baja California Norte y Sur.

Dátil.—N-facing slopes of the central ridge, common, ca 30 cm tall, *Wilder 07-124*. S-facing slope of ridge just N of center of island, less common than on N-facing slopes, *Wilder 07-140*.

Euphorbia prostrata Aiton. Tomítom hant cocpéetij; *golondrina*; ground spurge

New for Tiburón where we found it at a single locality along the eastern coast near the old Seri camp Zozni Cmiipla. This is the first record for a Gulf island. Known from widely separated localities in western Sonora, often in disturbed habitats (Steinmann & Felger 1997; Felger 2000b). Warm-weather ephemerals (short-lived perennials in non-desert regions).

Geographic Range.—Widespread in the Americas and naturalized in warm regions of the world.

Tiburón.—Vicinity of Zozni Cmiipla, sandy soil, *Wilder 06-513*.

Euphorbia xanti Engelm. ex Boiss. Hehe ix cooxp; *juemetón*

New for Tiburón. Common on the bajada of the northeastern side of the island and also documented from a canyon in the Sierra Kunkaak. Also on the opposite Sonoran mainland. Shrubs 1.5—2.5 m tall, often propagating by rhizomes (Fig. 4B).

Cody et al. (1983) hypothesized this species migrated from the Baja California peninsula to the Sonoran mainland via the Midriff islands. In addition, many other species show a similar distributional pattern: for example, Steinmann and Felger (1999) list six euphorbs with this pattern. In a thesis on the group (section *Alectoroctonum*) to which *E. xanti* belongs, *E. peganoides* Boiss. is given as the most similar relative of *E. xanti* (Ramírez 1996). Victor Steinmann (pers. comm., 2007) treats both *E. peganoides* and *E. colletioides* Benth. as synonyms of *E. cymosa* Poir. as eluded to by Steinmann and Felger (1997). *Euphorbia xanti* is the only member of section *Alectoroctonum* occurring on the Baja California peninsula, so the relatives of *E. xanti* are mainland taxa.

Geographic Range.—Predominately in Baja California Sur and the S half of Baja California Norte, and sporadically along 215 km of the Sonora coast, from near El Desemboque San Ignacio S to Bahía de Kino and farther S near Guaymas (Turner et al. 1995). Also on Islas Monserrat and Tortuga off Baja California Sur.

Tiburón.—Canyon on a N slope of Sierra Kunkaak, vicinity of Siimen Hax waterhole, cluster of five plants on N-facing wall on side of canyon, *Wilder 06-453*. Lower E bajada, near Valle de Águila, ca 4 km N of Punta Tormenta, common shrub ca 1.25 m tall, *Wilder 07-232*.

FABACEAE

Dalea bicolor Humb. & Bonpl. ex Willd. var. **orcuttiana** Barneby

New for Tiburón and the first record for this species for a Gulf island. Found on steep slopes of the Sierra Kunkaak—both island collections are from approximately the same locality. The nearest population occurs on the opposite mainland near the western base of the Sierra Seri range, which is a new record for this variety for mainland Mexico. Shrubs or subshrubs to 1+ m tall.

Geographic Range.—Variety *orcuttiana* was previously known only from the Baja California peninsula where it is widespread in both states.

Tiburón.—Sierra Kunkaak Mayor, Mar 2007, *Romero 07-3*. Cerro San Miguel, común en la cima, 8 Mar 1991, *Quijada-Mascareñas 91T019*.

Sonora mainland.—Vicinity of Cerro Pelón, 29°34'N, 112°09'W, ca 5 mi SE of Desemboque San Ignacio, 21 Apr 1968, *Felger 17936*.

Desmodium procumbens (Mill.) Hitchc. Tick clover

New for Tiburón where it appears to be widespread. The nearest known populations are in the vicinity of Hermosillo and the Guaymas region but it is expected in the Sierra Seri; the closest peninsular population is in the Sierra San Francisco. Short-lived summer/fall ephemerals on Tiburón and in western Sonora.

Geographic Range.—Baja California Sur and S Arizona to South America and the West Indies; also in the Old World where it is probably introduced.

Tiburón.—Haap Hill, 8 Sep 1974, *Felger T74-38*. Hant Hax camp, canyon bottom in lower foothills at base of mountain [Sierra Kunkaak], on way to Sopc Hax from Zozni Cmiipla, 26 Oct 1963, *Felger 9348*. Canyon bottom at N base of Sierra Kunkaak, between Sierra Kunkaak Mayor and Sierra Kunkaak Segundo, 395 m, *Wilder 06-409*.

***Pithecellobium dulce** (Roxb.) Benth. Camótzila; *guamúchil*; manila tamarind

New for Tiburón, where we found one young tree that had been planted at the Sopc Hax waterhole in the Sierra Kunkaak. Also planted in the Comcáac villages on the opposite mainland (Nabhan 2003).

Geographic Range.—Large trees native to the hot lowlands of Mexico and northern South America. Widely planted for its edible fruit throughout lowland Sonora but not known to persist untended (without supplemental water) within the Sonoran Desert, or at least in Sonora (Felger et al. 2001). Reid Moran documented a tree on Isla Cerralvo (16 Apr 1962, tree 5 m tall x 10 m, *Moran 9511, SD*).

Tiburón.—Sopc Hax waterhole, small tree ca 3 m tall, *Wilder 07-214*.

Rhynchosia precatória (Humb. & Bonpl. ex Willd.) DC. *Chanate pusi*, *ojo de pajarito*; rosary bean

New for Tiburón, where we found it in a deep canyon of the Sierra Kunkaak. This is the first record for it on a Gulf island. The nearest known localities are in the Sierra el Aguaje north of Guaymas (Felger 1999), ca 150 km to the southeast, and ca 160 km to the southwest in Baja California in the Sierra San Francisco. Perennial vines growing over shrubs.

Geographic Range.—Extreme S Arizona to northern South America.

Tiburón.—Deep canyon on N slope of Sierra Kunkaak, SW and up canyon from Siimen Hax waterhole, *Wilder 06-480*.

Tephrosia vicioides Schltdl.

New for Tiburón where it is widespread, often growing along sandy-gravelly washes. It also occurs on the opposite mainland in the Sierra Seri. Non-seasonal annuals (or sometimes short-lived perennials?) on Tiburón.

Geographic Range.—A somewhat variable species, widespread in the Americas including Baja California Sur.

Tiburón.—San Miguel Peak, 27 Oct 1979, *Knight 1019 et al.* (UNM). Arroyo Sauzal: Ca 2.75 mi inland from shore, *Wilder 06-99*; Ca 1.25 mi inland from shore, main wash channel, *Wilder 06-78*. SW part of Central Valley, ca 13 mi S of Tecomate, ca 450 ft, 2 Feb 1965, *Felger 12389*. Haap Hill, 11 Dec 1976, *Felger 76-T39*. Valley at E base of Sierra Kunkaak, ca 875 ft, *Wilder 06-51*. Foothills of NE portion of Sierra Kunkaak, *Wilder 06-445*.

HYDROPHYLLACEAE**Phacelia affinis** A. Gray

A single collection from the interior of the island is a new record for Tiburón and the first record for a Gulf island. The nearest known population is ca 150 km to the north in the Sierra del Viejo near Caborca. Cool-season ephemerals.

Geographic Range.—SW United States, N Sonora, and both states of Baja California.

Tiburón.—SW part of Central Valley, ca 13 mi S of Tecomate, 20 Feb 1968, *Felger 17337*.

MALPIGHIACEAE**Echinopterys eglandulosa** (Juss.) Small. Hap oáacajam

New for Tiburón and the first record for a Gulf island. We encountered a single shrub (conspicuous because of its bright yellow flowers) in a Sierra Kunkaak canyon but it is probably more widespread in these mountains. The nearest population is in the Sierra Seri on the opposite Sonoran mainland. Drought-deciduous shrubs. (Fig. 4C).

Geographic Range.—Sonora (S from the vicinity of El Desemboque San Ignacio and Altar) to Oaxaca.

Tiburón.—NE base of Sierra Kunkaak, S-facing side of arroyo in rocky talus, shrub 1.6 m tall, *Wilder 06-377*.

MALVACEAE

Abutilon palmeri A. Gray. Caate ipápl; *pelotaso*; Indian mallow

This species was listed by Gentry (1949), Felger and Lowe (1976), and Moran (1983) as occurring on Tiburón and other Gulf islands, but was not included in the checklist by Rebman et al. (2002). We confirm it for the southern and eastern parts of Tiburón. Sparsely branched, open and scarcely woody shrubs or subshrubs.

Geographic Range.—SW Arizona to Sinaloa, and SE California to the Cape Region of Baja California Sur, and many islands in the Gulf; disjunct in Tamaulipas.

Tiburón.—Arroyo Sauzal, ca 1 mi from shore, *Wilder 06-84*. Head of arroyo at base of Sierra Kunkaak, between Sierra Kunkaak Mayor and Sierra Kunkaak Segundo, *Wilder 05-30*. Canyon bottom at N base of Sierra Kunkaak, *Wilder 06-413*.

Horsfordia newberryi (S. Watson) A. Gray. *Mariola*; yellow felt plant, orange velvet mallow

New for Dátil where it is most common on steep slopes and rocky outcrops. It is common on nearby Tiburón and on San Esteban. Slender, erect shrubs with orange flowers.

Geographic Range.—Widespread in the Sonoran Desert including coastal Sonora, both states of Baja California, and Isla Ángel de la Guarda.

Dátil.—Steep rocky slopes, summit of island, ridge crest, rare, 4 Dec 1965, *Felger 13448*. NW side of island, 20 Dec 1966, *Felger 15343*.

MYRTACEAE

***Eucalyptus camaldulensis** Dehnh. *Eucalipto*; Murray red gum

New for Tiburón and a new plant family for the Gulf islands. Planted at Tecomate and persisting near two decaying small buildings. Not reproducing on the island or in the Sonoran Desert.

Geographic Range.—Native to Australia; this is the most commonly grown *Eucalyptus* in the Sonoran Desert and the most wide-ranging *Eucalyptus* species in Australia.

Tiburón.—Tecomate, about 6 trees ca 5 m tall, *Wilder 07-264*.

OROBANCHACEAE

Orobanche cooperi (A. Gray) Heller. Matar; *flor de tierra*; desert broom-rape

New for Tiburón and a new family record for the Gulf islands. The nearest record is from the vicinity of El Desemboque San Ignacio, ca 62 km to the north (Felger and Moser 1985), which previously was the southernmost record in Sonora. Apparently annuals, appearing in spring; parasitic.

Geographic Range.—Deserts and semiarid regions in SW United States and NW Mexico in Baja California Norte and northern Sonora.

Tiburón.—Cerro Kunkaak, 700 m, 11 Apr 1979, *Scott s.n., et al.* (UNM).

POACEAE

Aristida californica Thurb. ex S. Watson var. **glabrata** Vasey

Recorded for Tiburón by Reeder and Felger (1989) but not listed by Rebman et al. (2002). This interior Tiburón population is notable for the occurrence of var. *glabrata* well within the desert in contrast to its general distribution at higher elevation and/or in areas of higher precipitation, and for the most part geographically peripheral to the desert var. *californica*. Perennials and sometimes reproductive in the first season.

Geographic Range.—Arizona Upland in Arizona and Sonora, and both states of Baja California at the N and S margins of the desert. Also in grassland, oak grassland, and Chihuahuan Desert in S Arizona and N Sonora.

Tiburón.—Central Valley, 13 mi S of Tecamate, 20 Feb 1968, *Felger 17351*.

Bothriochloa barbinodis (Lag.) Herter. *Zacate popotillo*; cane bluestem

New for San Esteban, where it has been found only in a sheltered northwest-facing side canyon on the southwest side of the island. Isla San Pedro Nolasco is the only other Gulf island locality. The nearest populations are on the Sonora mainland, mostly at widely scattered sites of higher soil moisture such as north-facing cliffs and slopes, as well as canyons and waterholes especially in mountains. Tufted perennials.

Geographic Range.—Widespread in the Americas, mostly in non-desert regions including Baja California Norte and Sur, the closest peninsular location being the Sierra San Francisco.

San Esteban.—SW corner of island, sheltered canyon branched off from main drainage, ca 1 m tall, rare, 200 m, *Wilder 07-91*.

***Cenchrus echinatus** L. [*C. insularis* Scribn.]. *Guachapori*, *zacate toboso*; southern sandbur

New for Tiburón and the first record for this genus on a Gulf island other than the ubiquitous Sonoran Desert endemic *C. palmeri* Vasey. In our opinion *C. echinatus* is not native to the Sonoran Desert. It is common in weedy, disturbed places in the Bahía de Kino region and likely reached the island from there. Its occurrence at a fishing camp is strong evidence of the role fishermen or tourist campers (who often spend one to several nights on the islands) in being a vector for the spread of this and other non-native species (plants and animals) to Gulf islands. West and Nabhan (2002) report *C. brownii* Roem. & Schult. for Tiburón, but it is in fact *C. echinatus* and their report is based on the specimen cited here. The taxonomic distinction between the two species is subtle (John Reeder, personnel communication 2007). Warm weather annuals.

Geographic Range.—Widespread in the Americas and adventive in the Old World; often weedy.

Tiburón.—Fishing camp at Ensenada del Perro, just above high tide, 31 Oct 1993, *Burillón s.n.*

Chloris crinata Lag. [*Trichloris crinita* (Lag.) Parodi]. *Zacate escoba*; feather fingergrass

New for Tiburón, where we found it only on the lower portion of the extensive eastern bajada in a swale supporting dense desert scrub. It was growing through desert shrubs, the stems mostly 1.5—2 m tall, and intermixed with *C. virgata*, which was decidedly more numerous and extensive. The nearest known populations are in western Sonora near the Arizona border (*Felger 2000b*), and to the south at Bahía San Pedro (*Felger 11620*) north of Guaymas and on Isla San Pedro Nolasco. Large, tufted perennials, growing and reproductive during the warmer months.

Recent data shows that this species is best treated as *Chloris* (Travis Columbus, pers. comm., 2007).

Geographic Range.—Arizona to Texas and northern Mexico, and disjunct in South America.

Tiburón.—Vicinity of Zozni Cmiipla, *Wilder 06-512*.

Chloris virgata Sw. *Zacate lagunero*; feather fingergrass

New for Tiburón where it was locally abundant at the inland margin of the *Frankenia palmeri* zone on the lower portion of the eastern bajada. It is common and weedy on the Sonoran mainland in the Bahía de Kino region. Warm-weather annuals, highly variable in size (ca 10—80 cm tall).

Geographic Range.—Widespread in the Americas including Baja California Sur where the closest peninsular location is in the Sierra San Francisco; also introduced in the Old World.

Tiburón.—Vicinity of Zozni Cmiipla, abundant in water channels and decreasing in density towards the *Frankenia* zone (seen from this point southward for at least several km), mostly ca 60—80 cm tall, *Wilder 06-353*.

Enneapogon desvauxii P. Beauv. *Zacate lobero*; spike pappusgrass

New for Tiburón; documented from two inland sites. The nearest known populations are in western Sonora in the vicinity of Hermosillo and near the Arizona border (*Felger 2000b*) but it can be expected closer in coastal mountains. Small, tufted perennials.

Geographic Range.—This species is cosmopolitan. The closest peninsular population is in Baja California Norte just north of Calmalli, about 140 km from Tiburón.

Tiburón.—Haap Hill, 11 Dec 1976, *Felger 76-T17*. Deep canyon on N slope of Sierra Kunkaak, SW and up canyon from Siimen Hax waterhole, *Wilder 06-464*.

Leptochloa dubia (Kunth) Nees [*Diplachne dubia* (Kunth) Scribner]. Green sprangletop New for Tiburón, where we found it near sea level along the eastern shore. It is common on the mainland above the desert and there are but few, scattered records for it at lower elevations within the Sonoran Desert (Felger 2000b). Tufted perennials.

Geographic distribution.—SW US, Florida and México including Baja California Sur to South America.

Tiburón.—1 km inland from Zozni Quimpilla, N side of Punta San Miguel, *Wilder 06-371*.

***Pennisetum ciliare** (L.) Link. Oot iconée (coyote's grass); *zacate buffel*, *buffel*; buffelgrass New for Tiburón. It has been in the vicinity of Caracol at least since 1998 (West & Nabhan 2002). This is currently the most actively used and disturbed site in the interior of the island, and where Comcáac guides often stay with bighorn sheep hunters during prolonged hunting activities on the island. A second population was found in 2007 just inland from Estero San Miguel on the eastern bajada. On the Sonoran mainland buffelgrass is extensively planted for cattle grazing after removing the desert vegetation. For example, one large plot was observed in 2007 at the western base of Pico de Johnson of the Sierra Seri. Buffelgrass lines Highway 10 linking Hermosillo and Bahía de Kino, and is especially thick at the entrance to the coastal town. It also is along the length of the road between Kino Nuevo and Punta Chueca and is expanding in this area. Perennials and often reproductive in the first season; growing and reproductive with sufficient soil moisture especially during the warmer months.

Buffelgrass was reported for Alcatraz (West & Nabhan 2002; West et al. 2002), where it is said to be eradicated (Tad Pfister, pers. comm., 2006), although there are no voucher specimens for the island. Extensive buffelgrass on the nearby mainland makes continued re-population likely.

The Midriff islands are free of significant populations of buffelgrass. Unlike most of the Sonoran Desert, a unique opportunity exists to control this invasive species on the Gulf islands before it becomes nearly impossible to thwart its invasion and the subsequent ecosystem transformation associated with this noxious weed (Búrquez et al. 2002; Franklin et al. 2006). This species is one of the most serious conservation threats to Tiburón and other Gulf islands (West & Nabhan 2002). Immediate reporting of new populations followed by control efforts is essential.

In May 2007, Humberto asked Steve and Cathy Marlett for suggestions for a Seri name for *buffel* — so that the people could recognize it by name. The three of them decided to call it *oot iconée*, because unusual or odd items are said to belong to the coyote. Humberto and other Comcáac are attempting to eradicate it from Tiburón.

Geographic Range.—Native to the Old World and widely introduced for forage and fodder in arid and semiarid regions worldwide, and generally becoming invasive.

Tiburón.—Caracol Research Station, E foothills of Sierra Kunkaak, small canyon arroyo: 100 m W of station, scattered plants occur along a 100 m section of the arroyo, with the total population ca 50 plants, 24 May 2006, *Wilder 06-151*; Population expanded since May 2006, buffel lines arroyo for ca 200 m, all plants pulled, 3 May 2007, *Wilder 07-230*. Vicinity of Estero San Miguel, ca 0.75 km S of Zozni Cmiipla and ca 400 m inland, scattered populations in the area, 28°57.824'N, 112°13.241'W, in total ca 200 plants, many seedlings, all plants pulled, 4 May 2007, *Wilder 07-232*. Lower E bajada, ca 3.75 km S of Zozni Cmiipla and ca 500 m inland, along road that leads to Pazj Hax waterhole, 28°56.171'N, 112°13.503'W, single plant seen, pulled, 2 May 2007, *Wilder* (observation).

Setaria leucopila (Scribn. & Merr.) K. Schum. Hasac, xiica quiix; white-haired bristlegrass Recorded as *S. macrostachya* Kunth for San Esteban by Johnston (1924) and Tiburón, San Esteban, and Dátil by Felger and Lowe (1976) and Moran (1983). The specimens are identifiable as *S. leucopila* if one is to rec-

ognize it as distinct from *S. macrostachya* (see McVaugh 1983:361). Rebman et al. (2002) omit *S. macrostachya* and *S. leucopila* from the main checklist but report *S. macrostachya* from Dátil. Here we re-confirm Tiburón and San Esteban island occurrences of *S. leucopila* with specimens. Densely tufted perennials.

Geographic Range.—Central and NW Mexico including Baja California Norte y Sur and SW United States.

Tiburón.—Deep canyon on N slope of Sierra Kunkaak, SW and up canyon from Siimen Hax waterhole, *Wilder 06-478*. Canyon bottom at N base of Sierra Kunkaak, *Wilder 06-421*. Coralitos, S end of island, just inland from beach, ca 5 m, *Wilder 06-55*. La Pescadita, S shore of island, 11 Oct 1977, *Wilkinson s.n.*

San Esteban.—Arroyo Limantour, *Van Devender 92-482*. Arroyo [Limantour], 13 Oct 1977, *Wilkinson s.n.*

Sporobolus virginicus (L.) Kunth. Xojásjc; *zacate salado de la playa*; seashore dropseed
Felger and Moser (1985, p. 316) reported it for Tiburón “along beaches and inland margins of mangroves” but it is not listed for the island by Moran (1983a) and Rebman et al. (2002). We confirm its presence with a specimen. Perennial saltgrass; the Gulf of California plants are notably robust.

Geographic Range.—Tropical and subtropical shores worldwide. Tiburón and Alcatraz and the Sonora coast S from near Bahía de Kino, and the Baja California peninsula S from Bahía de San Francisquito.

Tiburón.—Zozni Cmiipla at Estero San Miguel, *Wilder 06-361*.

Tridens muticus (Torr.) Nash var. **muticus**. Slim tridens

New for Tiburón. We found it in the interior of Sierra Kunkaak. The nearest known population is 150 km to the north in the Sierra del Viejo southwest of Caborca, which is the southernmost documentation for this grass for mainland Sonora (Felger 2000b).

It is one of the most widespread and drought-tolerant perennial grasses of the Sonoran Desert; often in surprisingly harsh, xeric habitats. Tightly clumping small perennials; growth and flowering response apparently non-seasonal depending on soil moisture.

Geographic Range.—SW United States and N Mexico (N Sonora, N Baja California Norte, Chihuahua, Coahuila, and Nuevo León); deserts, grasslands, and oak woodland.

Tiburón.—Canyon bottom at N base of Sierra Kunkaak, between Sierra Kunkaak Mayor and Sierra Kunkaak Segundo, 405 m, *Wilder 06-401*. Deep canyon on N slope of Sierra Kunkaak, SW and up canyon from Siimen Hax waterhole, *Wilder 06-479*.

Urochloa fusca (Sw.) B.F. Hansen & Wunderlin [*Brachiaria fasciculata* (Sw.) Parodi] Browntop signal-grass

New for Tiburón and San Esteban. It is apparently fairly common locally following times of favorable summer/fall rains. The nearest populations are on the Sonoran mainland at Bahía de Kino (*Van Devender 90-519*). Summer/fall ephemerals, highly variable in size.

Geographic Range.—Widespread in the Americas including Baja California Sur.

Tiburón.—Vicinity of Haap Hill, 11 Dec 1976, *Felger 76-T10*.

San Esteban.—Arroyo Limantour, uncommon annual, 15 Sep 1990, *Van Devender 90-537*.

PORTULACACEAE

Portulaca oleracea L. *Verdolaga*; purslane

New report for Tiburón. The two widely separated localities on the island indicate it is probably more widely distributed. It is widespread on the adjacent Sonora coast. Warm weather annuals.

Geographic Range.—Worldwide in tropical to warm-temperate climates including Baja California Norte y Sur. It is often difficult to determine which populations might be native.

Tiburón.—Ensenada de la Cruz, 27 Feb 1965, *Felger 12778*. Haap Hill, 8 Sep 1974, *Felger T74-24*.

PTERIDACEAE

Notholaena californica D.C. Eaton subsp. **californica**. California cloak fern

New for San Esteban. This is the only fern on San Esteban where it occurs in sheltered north-facing canyons

in the southern part of the island. On Tiburón and San Esteban it is restricted to seasonally moist niches among rocks. It is the most widely distributed fern on Tiburón and other Gulf islands (Johnston 1924:980), and one of the most xeric-inhabiting ferns in the Sonoran Desert (e.g., Felger 2000b). Small tufted ferns or with short rhizomes.

Geographic Range.—S California to the Cape Region of Baja California Sur, S Arizona, and N Sonora to the vicinity of Bahía de Kino (see Felger 2000b).

San Esteban.—SW corner of island: Sheltered canyon branched off from main drainage, in sheltered nooks below rocks, extremely common in this side canyon only, *Wilder 07-86*; W-most N-trending canyon in the area, in sheltered nooks below rocks, occasional, *Wilder 07-93*.

Notholaena lemmonii D.C. Eaton var. **lemmonii**

New for Tiburón, where it grows in sheltered sites at higher elevation in the Sierra Kunkaak. The nearest known populations are in the Sierra el Aguaje, ca 150 km to the southeast (e.g., Bahía San Pedro; Johnston 1924, p. 980) and on Isla San Pedro Nolasco, ca 140 km to the SE of Tiburón. Small tufted ferns.

Geographic Range.—Mountains in Arizona, Chihuahua, much of Sonora, Baja California Sur, and on Isla Cerralvo.

Tiburón.—Sierra Caracol [part of Sierra Kunkaak], 27 Oct 1979, *Knight 1062 et al.* (UNM). Top of Sierra Kunkaak Segundo, ca 450 m, *Wilder 06-493*.

Notholaena standleyi Maxon. Star cloak fern

New for Tiburón, found at higher elevations in the Sierra Kunkaak, and the first record for a Gulf island. It occurs in the Sierra Seri in adjacent western Sonora.

Small tufted ferns. Ours belong to the western “golden race,” so called because of the golden-colored exudate or farina on the lower surface of the leaf blades.

Geographic Range.—SW United States and northern Mexico to Pueblo.

Tiburón.—Cerro San Miguel, *Quijada-Mascareñas 91T013*. S slope of Sierra Kunkaak, in sheltered rock crevice, ca 350 m, rare, 1 Jan 2006, *Wilder* (photo).

RUBIACEAE

Galium proliferum A. Gray. Desert bedstraw

New for Tiburón and the first record for a Gulf island. The nearest known locality is on the Baja California peninsula in the Sierra Asamblea just northwest of Bahía de los Angeles, ca 140 km west from the Sierra Kunkaak. It is also present in Sierra el Aguaje (La Balandrona, *Felger 01-650*), ca 150 km to the southeast. Delicate, small and often minute winter-spring ephemerals.

Geographic Range.—SE California to W Texas and northern Mexico.

Tiburón.—Base of the N portion of Sierra Kunkaak, ca 2 km E of Siimen Hax waterhole, 360 m, sand-gravel soil in shaded margin of arroyo bed among leaf litter, *Wilder 06-458*.

Galium stellatum Kellogg var. **eremicum** Hilend & J.T. Howell. Starry bedstraw

New for San Esteban, collected by Frank J. Wegscheider of California State University, Fullerton. The nearest population is on Isla San Lorenzo (Moran 1983a). Not recorded from Tiburón, although it occurs on the opposite mainland at Cerro Tepopa. Untidy small shrubs or subshrubs.

Geographic Range.—Mostly in desert mountains; SW United States to N Baja California Sur and N Sonora southward in arid, coastal mountains to Cerro Tepopa (29°21'N).

San Esteban.—Inland on NE quadrant of island, (UTM 12 3178413 N, 12 345752 E, NAD 83), 30 Mar 2005, *Wegscheider 101* (SD).

SAPOTACEAE

Sideroxylon leucophyllum S. Watson. Hehe pnaacoj

New for Tiburón and the first report for mainland Sonora. On Tiburón we know of it only on the north-face of an eastern peak of the Sierra Kunkaak, where it grows on a steep talus of large boulders (Fig. 3B). Here

it is locally common, developing into large shrubs and small trees to ca 5 m tall with substantial trunks to ca 30 cm in diameter. The peaks of San Esteban and Tiburón are often shrouded in fog clouds—these mountains “make their own microclimate.” The leaves of *S. leucophyllum* are densely woolly-pubescent and might be efficient in capturing moisture. On San Esteban it occurs only in a few sheltered canyons and ridgecrests. On 4 May, 2007, Benjamin spotted a small population with binoculars on a steep talus slope of Pico de Johnson, on the Sonora mainland opposite Sierra Kunkaak. Who will be the first to confirm this mainland sighting with a specimen?

Geographic Range.—Previously known only from Baja California (Norte) and Islas Ángel de la Guarda and San Esteban.

Tiburón.—Cerro Kunkaak, 700 m, 11 Apr 1978, *Scott s.n., et al.* (UNM 53277). Cerro San Miguel, árbol de baja estatura, común en laderas rocosas, principalmente en la ladera norte, 4—5 m, con tronco definido, *Quijada-Mascareñas 91T009*. Top of Sierra Kunkaak Segundo, ca 490 m, N-facing slope among talus boulders, large trunks, *Wilder 06-491*.

SOLANACEAE

Lycium berlandieri Dunal var. ***longistylum*** C.L. Hitchc. *Bachata, salicioso*

New species record for Tiburón. There are records from the Sierra el Aguaje north of Guaymas, ca 150 km to the southeast, and in the vicinity of Hermosillo, although we expect it in closer mountains. Shrubs with smooth, dark red-brown bark, white or pale yellow-white flowers, and campanulate corollas.

Geographic Range.—This species occurs in SW United States and NW Mexico. Var. *longistylum* ranges from central and SW Arizona southward in W Sonora to the Guaymas region (Chiang-Cabrera 1981).

Tiburón.—Base of N portion of Sierra Kunkaak, Siimen Hax waterhole, ca 355 m, *Wilder 06-454*.

Physalis crassifolia Benth. var. ***versicolor*** (Rydb.) Waterf. *Xtoozp*; tomatillo del desierto; desert ground cherry

New for Dátil, where it was found on the peaks of the north-central part of the island. It is widespread on nearby Tiburón. Small perennial subshrubs.

Geographic Range.—SW United States and NW Mexico. Two other varieties occur in the Baja California peninsula and on Gulf islands.

Dátil.—Peak of N-central part of island, ca 140 m, *Wilder 07-126*.

TAMARICACEAE

****Tamarix aphylla*** (L.) H. Karst. Hocö hapéc (translated as: any planted tree from outside of the area); *pino salado*; athel tree, salt cedar

West and Nabhan (2002) report it on Tiburón, but it is not listed for the island by Moran (1983a) and Reberman et al. (2002). We confirm its presence with specimens from two localities. Tamarisk trees were planted to a significant extent at the now abandoned small military station at Tecomate and there are also several trees at the active Mexican marine station at Punta Tormenta. These trees were planted several decades ago and have persisted to develop into large, healthy shade trees, but are not reproducing.

Geographic Range.—Native to the Old World and extensively planted in the Sonoran Desert including the villages on the Sonoran mainland opposite Tiburón (Felger & Moser 1985).

Tiburón.—Palo Fierro [Punta Tormenta], just inland from beach, *Wilder 06-143*. Tecomate, ca 30 individuals planted in rows, trees ca 6 m tall forming dense cover, a few also near two decaying buildings where a few *Eucalyptus* are also planted, *Wilder 07-250*.

ULMACEAE

Celtis reticulata Torr. *Cumero*; canyon hackberry, western hackberry

New for Tiburón and the first record for a Gulf island. We found it on a high rock talus in the Sierra Kunkaak, a surprising and unusual habitat for this species (it usually grows along riparian or semi-riparian drainageways). The nearest Sonoran populations are in deep riparian canyons in the Sierra el Aguaje north of

Guaymas, such as Cañón Nacapule (Felger 1999) and the closest peninsular population is in the Sierra San Francisco. Shrubs on Tiburón; trees with smooth, gray bark in west-central and southern Sonora.

The type locality is considered to be somewhere in Colorado (James Henrickson, pers. comm., 2006), and trees from that region might not be conspecific with those in southern Sonora. The Arizona and especially the Tiburón and Sonoran populations have relatively thick leaves. The southern Sonora populations are essentially evergreen rather than winter-deciduous like those farther north (Felger et al. 2001).

Geographic Range.—Widespread in W North America including Baja California Sur.

Tiburón.—Top of Sierra Kunkaak Segundo, 490 m, shrub ca 2 m tall, *Wilder 06-486*.

VERBENACEAE

Lantana velutina M. Martens & Galeotti. *Confiturilla blanca*

New for Tiburón. The nearest locality in Sonora is in the Sierra el Aguaje (La Balandrona, *Gutiérrez 00-07*, USON) and the closest peninsular population is in the Sierra San Francisco. The only other Gulf island record is for Cerralvo (Rebman et al. 2002), the most southern Gulf island. Small shrubs with corollas white to cream.

Geographic Range.—Baja California Sur and Sonora to Panama.

Tiburón.—Cerro San Miguel, flores de color blanco a crema, de común a abundante en la pendiente del cerro, *Quijada-Mascareñas 90T011*. Top of Sierra Kunkaak Segundo, 425–490 m, common on slope and becoming less so closer to the peak, shrubs ca 1 m tall, flowers bright white, *Wilder 06-484*.

ZYGOPHYLLACEAE

***Tribulus terrestris** L. Cōsi cahóota, cōzazni caacōl, hee inóosj, heen ilít, hehe ccosyat; *torito*, *toboso*; goathead, puncture vine

New for Tiburón and Alcatraz. The localities on these islands are along the shore with sand soil and associated with human disturbance. *Tribulus* is abundant in disturbed habitats along the adjacent Sonora coast. Warm weather ephemerals.

Geographic Range.—Native to the Old World, this noxious weed is now widespread in the warmer regions of the world.

Tiburón.—Punta Tormenta, ca 1.5 km S of military (marine) station, *Wilder 06-345*.

Alcatraz.—12 Nov 2001, *Gracida 35* (Prescott College Collection). Sand flat at E side of island, not common, 8 Oct 1966, *Felger 14923*.

GAZETTEER

Key to Abbreviations: **BCN** = Baja California Norte, **BCS** = Baja California Sur, **EST** = Isla San Esteban, **SON** = Sonora, **TIB** = Isla Tiburón. Coordinates are from Google Earth.

Arroyo Limantour (EST). Main drainage of the island, terminating on the E shore at 28°41'14.7"N, 112°32'53.7"W.

Arroyo Sauzal (TIB). Major drainage of the S part of the island, 28°47'53"N, 112°25'28"W at the coast.

Bahía de Kino (SON). Coastal fishing and vacation town; largest population center in the vicinity of the Midriff islands.

Bahía de San Francisquito (BCN). NE part of the state. 28°26'24"N, 112°52'14"W.

Bahía San Pedro (SON). Ca 20 km NW of San Carlos and ca 15 km NE of Isla San Pedro Nolasco. 28°03'17"N, 111°14'39"W.

Balandrona, La (SON). Deep riparian canyon on the N side of the Sierra Aguaje, canyon mouth in the vicinity of 28°06'N, 111°04'17"W, ca 210 m.

Canal del Infiernillo (SON). Shallow channel separating Tiburón from the mainland. N end at 29°14'49"N, 112°15'10"W and S end at 28°57'58"N, 112°10'57"W.

Caracol Research Station (TIB). E side and base of Sierra Kunkaak. 29°00'56.7"N, 112°17'36.9"W, 190 m.

Central Peak (EST). The major mountain mass, dominating the interior, peak at 28°42'29.02"N, 112°34'31.86"W.

Central Valley [= Valle Agua Dulce] (TIB). Expansive valley draining to the N shore, between Sierra Kunkaak on the E and Sierra Menor on the W, running the majority of the island's length.

Cerro San Miguel [= Sierra Kunkaak Segundo] (TIB). High eastern peak of the Sierra Kunkaak, slightly less than 1,000 m. 28°58'52.27"N, 112°18'30.96"W.

Coralitos (TIB). Cove at S shore. 28°45'30"N, 112°19'20"W.

Desemboque del Río San Ignacio, El (SON). Northern of the two Comcáac villages. 29°30'15"N, 112°23'46"W.

- Ensenada de la Cruz [=Pescadita, La] (TIB).** Bay at S shore. 28°45'54"N, 112°21'4.56"W.
- Ensenada del Perro (TIB).** Temporary fishing camp at SE shore. 28°46'54"N, 112°16'20"W.
- Esteros San Miguel (TIB).** Tidal wetland with mangroves in prominent sandy peninsula (Punta San Miguel) at E shore of island and S end of Canal del Infiernillo. 28°58'14"N, 112°12'09"W.
- Haap Hill (TIB).** SE side of Central Valley, ca 12 mi S from Tecomate. N side and base of basaltic hills, vicinity of former Seri camp *Haap Caaizi Quih Yaii*, named for gathering of wild tepary beans (Felger & Moser 1985; Moser & Marlett 2005). Vicinity of 28°57'20"N, 112°24.5'W, ca 280 m. Felger collections: 8 Sep 1974 with Cayetano Montaña, Hank Gunn, and Alexander Russell; 11 Dec 1976 with Rosa Flores, Cathy Moser Marlett, and Alexander Russell.
- Hant Hax (TIB).** Former Seri camp, at E base of Sierra Kunkaak, between Sopc Hax and Zozni Cmiipla; approximately 28°57'30"N, 112°15'30"W.
- Pescadita, La (TIB).** [See **Ensenada de la Cruz**]
- Palo Fierro (TIB).** See Punta Tormenta.
- Pazj Hax [= Tinaja Anita] (TIB).** Waterhole at E base of Sierra Kunkaak. 28°56'25.41"N, 112°16'45.63"W.
- Pico de Johnson (SON).** Highest peak in the Sierra Seri, summit ca 29°02'15.65"N, 112°08'14.66"W.
- Punta Chueca (SON).** Southern of the two Comcáac villages. 29°00'54"N, 112°09'37"W.
- Punta Tormenta [= Palo Fierro landing field] (TIB).** Small Mexican Marine station and Comcáac vehicle-staging area on the E shore opposite Punta Chueca. 29°01'11"N, 112°11'43"W.
- Sierra el Aguaje (SON).** Extensive coastal mountain mass to the N of San Carlos (N of Guaymas), including Cañón del Napule (see Felger 1999).
- Sierra Bacha [= Sierra Cirio] (SON).** Granitic mountains S of Puerto Libertad (29°50'40"N, 112°38'18"W) and N of El Desemboque del San Ignacio.
- Sierra del Viejo (SON).** Large mountain mass ca 45 km SW of Caborca. 30°20'35"N, 112°19'54"W.
- Sierra Kunkaak (TIB).** Largest and highest (1,200+ m) mountains on the island, running along most of the E side of the island.
- Sierra Kunkaak Mayor (TIB).** The highest and most extensive portion of the Sierra Kunkaak, containing deep, sheltered canyons.
- Sierra Kunkaak Segundo (TIB).** The E peak of Sierra Kunkaak; see Cerro San Miguel.
- Sierra San Francisco (BCS).** Large volcanic mountain range, ca 1,600 m tall, S of state line separating Baja California and Baja California Sur. The range provides a link between tropical components of the southern peninsula and temperate influences of the north. 27°39'20"N, 112°54'58"W. (Jon Rebman, pers. comm., 2007).
- Sierra Seri (SON).** Extensive range on mainland opposite the Sierra Kunkaak (see Pico de Johnson).
- Siimen Hax (TIB).** Waterhole in the Sierra Kunkaak. 28°58'47.2"N, 112°19'30.6"W.
- Sopc Hax (TIB).** Waterhole in the Sierra Kunkaak. 28°57'15.9"N, 112°16'39.3"W.
- Tecomate (TIB).** Former Comcáac village on the N shore, and more recently site of abandoned small military station. 29°11'12"N, 112°24'58"W.
- Tinaja Picu (SON).** Collection site of Ira Wiggins, in the Sierra Picu, along the road from Pitiquito to Puerto Libertad, ca 20 mi from the coast.
- Valle Agua Dulce (TIB).** See Central Valley.
- Valle de Águila (TIB).** An area of bajada at the NE side of the island. Vicinity of 29°05'28.68"N, 112°15'15.12"W.
- Zozni Cmiipla (TIB).** Historic Comcáac camp near the base of Estero San Miguel on the E side of the island. 28°58'08"N, 112°12'52"W.

ACKNOWLEDGMENTS

Many friends and colleagues have facilitated our work on the islands. Dave Bertelsen, Alberto Búrquez-Montijo, Exequiel Ezcurra, Edward Gilbert, Mikhal Gold, Jesús Sanchez-Escalante, Gloria Guadalupe Morales-Figueroa, Powell B. (Gil) Gillenwater III, Florencio Cota-Moreno, Jesús Ventura-Trejo, and Seth Turner accompanied us in the field—thank you for sharing in the adventure. Ana Luisa Rosa Figueroa-Carranza of CONANP, Larry Johnson at Bahía de Kino, Tad Pfister and the Prescott College Center for Cultural and Ecological Studies at Bahía de Kino, and William J. (Bill) Risner of Tucson provided logistical support and shared their knowledge of the region. A. Elizabeth (Betsy) Arnold, Exequiel Ezcurra, Cathy Moser Marlett, Stephen Marlett, John R. Reeder, and Charlotte Goodding Reeder provided valuable information and assistance. Cathy Moser Marlett prepared the maps. Previous floristic work on the Gulf islands, especially that by Reid Moran and Jon P. Rebman, provided the foundation for this publication. Brad Boyle, Phil Jenkins, and Michelle (Shelley) M. McMahan of the University of Arizona herbarium (ARIZ), and Jon P. Rebman and especially Judy Gibson of the herbarium of the San Diego Natural History Museum (SD) provided valuable

assistance. Additionally we thank Xavier Basurto, Travis Bean, Julio Betancourt, Janice E. Bowers, Thomas Bowen, Mark Dimmitt, Christopher K. Frazier (UNM), Powell B. (Gil) Gillenwater III, Paul Knight, R. James (Jim) Hills, Paul S. Martin, Jane Mygatt (UNM), Ana Lilia Reina-Guererro, Peter Sherman, Raymond M. Turner, Thomas Van Devender, and Michael Wilson for their help. Collections have been made under Mexican Federal Collecting permit NOM-126-SEMARNAT-2000 obtained with the generous assistance of Exequiel Ezcurra. We appreciate comments by reviewers John L. Anderson and Jon P. Rebman.

Funding for this project has been received by Wilder from the University of Arizona Mycological Herbarium, Arizona-Nevada Academy of Science, University of Arizona Honors College Alumni Legacy Grants, The University of Arizona Department of Ecology and Evolutionary Biology's Leslie N. Goodding Memorial Scholarship, and the Research Committee of the Cactus and Succulent Society of America. Felger received support from the Wallace Research Foundation and more recently the World Wildlife Fund in collaboration with El Área de Protección de Flora y Fauna (APFF) "Islas del Golfo de California" en Sonora, de la Comisión Nacional de Áreas Naturales Protegidas (CONANP), de la Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT).

REFERENCES

- AUSTIN, D.F. 1998. Convolvulaceae, morning glory family [Vascular plants of Arizona]. *Arizona-Nevada Acad. Sci.* 30:61–83.
- BÚRQUEZ-MONTUJO, A., M.E. MILLER, and A. MARTÍNEZ-YRÍZAR. 2002. Mexican grasslands, thornscrub, and the transformation of the Sonoran Desert by invasive exotic buffelgrass (*Pennisetum ciliare*). In: B. Tellman, ed. *Invasive exotic species in the Sonoran Region*. University of Arizona Press and Arizona-Sonora Desert Museum, Tucson. Pp. 126–146.
- CASE, T.J. and M.L. CODY (eds.). 1983. *Island Biogeography in the Sea of Cortéz*. University of California Press, Berkeley.
- CASE, T.J., M.L. CODY, and E. EZCURRA (eds.). 2002. *A new island biogeography of the Sea of Cortés*. University of California Press, Berkeley.
- CHIANG-CABRERA, F. 1981. *A taxonomic study of the North American species of Lycium (Solanaceae)*. Ph.D. dissertation, University of Texas, Austin.
- CODY, M.L., R. MORAN, and H. THOMPSON. 1983. The plants. In: T.J. Case and M.L. Cody, eds. *Island biogeography in the Sea of Cortéz*. Oxford University Press, New York. Pp. 49–97.
- DANIEL, T.F. 1986. Systematics of *Tetramerium* (Acanthaceae). *Syst. Bot. Monogr.* 12:1–134.
- DANIEL, T.F. 1997. The Acanthaceae of California and the peninsula of Baja California. *Proc. California Acad. Sci.* 49:309–403.
- DANIEL, T.F. 2004. Acanthaceae of Sonora: taxonomy and phytogeography. *Proc. California Acad. Sci.* 55:690–805.
- FELGER, R.S. 1999. The flora of Cañón del Nacapule: a desert-bounded tropical canyon near Guaymas, Sonora, Mexico. *Proc. San Diego Soc. Nat. Hist.* 35:1–42.
- FELGER, R.S. 2000a. The Seris and the guy who cuts the tops off plants. "Seri Hands, a special issue," *J. Southwest* 42:521–543.
- FELGER, R.S. 2000b. *Flora of the Gran Desierto and Río Colorado of northwestern Mexico*. University of Arizona Press, Tucson.
- FELGER, R.S. 2002. Sinaloa shootout. In: T. Bowen, ed. *Backcountry Pilot: Flying Adventures with Ike Russell*. University of Arizona Press, Tucson. Pp. 2–14.
- FELGER, R.S. 2004. Seed plants of the Northern Gulf of California. In: R.C. Brusca, E. Kimrey, and W. Moore, eds. *A seashore guide to the Northern Gulf of California*. Arizona-Sonora Desert Museum, Tucson. Pp. 147–163.
- FELGER, R.S., M.B. JOHNSON, and M. F. WILSON. 2001. *Trees of Sonora, Mexico*. Oxford University Press, New York.
- FELGER, R.S. and E. JOYAL. 1999. The Palms (Arecaceae) of Sonora, Mexico. *Aliso* 18:1–18.
- FELGER, R.S. and C.H. LOWE. 1976. The island and coastal vegetation and flora of the northern part of the Gulf of California, Mexico. *Nat. Hist. Mus. Los Angeles County, Contr. Sci.* 285:1–59.

- FELGER, R.S. and M.B. MOSER. 1985. People of the desert and sea: ethnobotany of the Seri Indians. University of Arizona Press, Tucson. Reprinted 1991.
- FRANKLIN, K.A., K. LYONS, P.L. NAGLER, D. LAMPKIN, E.P. GLENN, F. MOLINA-FREANER, T. MARKOW, and A.R. HUETE. 2006. Buffelgrass (*Pennisetum ciliare*) land conversion and productivity in the plains of Sonora, Mexico. *Biol. Conservation* 127:62–71.
- GENTRY, H.S. 1949. Land plants collected by the Velero III. Allan Hancock Pacific Expeditions 1937–1941. Allan Hancock Pacific Expeditions 13.
- HENDERSON, A., G. GALEANO, and R. BERNAL. 1995. Field guide to the palms of the Americas. Princeton University Press, Princeton.
- JOHNSTON, I.M. 1924. Expedition of the California Academy of Sciences to the Gulf of California in 1921: the botany (vascular plants). *Proc. California Acad. Sci.* 4, 12:951–1218.
- McMillan, C. and R. Phillips. 1979. *Halodule wrightii* Aschers in the Sea of Cortez, Mexico. *Aquatic Bot.* 6: 393–396.
- McVAUGH, R. 1983. Flora Novo-Galiciana, vol. 14, Gramineae. University of Michigan Press, Ann Arbor.
- MELING-LÓPEZ, A.E. and S.E. IBARRA-OBANDO. 1999. Annual life cycles of two *Zostera marina* L. populations in the Gulf of California: contrasts in seasonality and reproductive effort. *Aquatic Bot.* 65:59–69.
- MORAN, R. 1983a. Vascular plants of the Gulf Islands. In: T.J. Case and M.L. Cody, eds. Island biogeography in the Sea of Cortéz. University of California Press, Berkeley. Pp. 348–381.
- MORAN, R. 1983b. The vascular flora of Isla Ángel de la Guarda. In: T.J. Case and M.L. Cody, eds. Island biogeography in the Sea of Cortéz. University of California Press, Berkeley. Pp. 382–403.
- MORAN, R. and J. REBMAN. 2002. Plants on some small Gulf islands. In: T.J. Case, M.L. Cody, and E. Ezcurra, eds. A new island biogeography of the Sea of Cortés. Oxford University Press, New York. Pp. 527–534.
- MOSER, M.B. and S.A. MARLETT (compilers). 2005. Comcáac quih yaza quih hant ihíip hac; diccionario Seri-Español-Inglés. Editorial UniSon, Plaza y Valdés Editores, México D.F.
- NABHAN, G.P. 2003. Singing the turtles to sea: the Comcáac art and science of reptiles. University of California Press, Berkeley.
- RAMÍREZ R., M.A. 1996. Revisión taxonómica de *Euphorbia* subgénero *Agaloma* sección *Alectoroctonum* (Euphorbiaceae) en México. Tesis de maestría, Universidad Nacional Autónoma de México, Facultad de Ciencias, México, D.F.
- REBMAN, J.P., J.L. LEON DE LA LUZ, and R.V. MORAN. 2002. Vascular plants of the Gulf Islands. In: T.J. Case, M.L. Cody, and E. Ezcurra, eds. A new island biogeography of the Sea of Cortés. Oxford University Press, New York. Pp. 465–510.
- REEDER, J.R. and R.S. FELGER. 1989. The *Aristida californica-glabrata* complex (Gramineae). *Madroño* 36:187–197.
- SHREVE, F. 1951. Vegetation of the Sonoran Desert. Carnegie Inst. Washington Publ. 591:1–192.
- STEINMANN, V.W. and R.S. FELGER. 1997. The Euphorbiaceae of Sonora, Mexico. *Aliso* 16:1–71.
- TORRE COSÍO, J. 2002. Inventory, monitoring and impact assessment of marine biodiversity in the Seri Indian Territory, Gulf of California, Mexico. Ph.D. dissertation, University of Arizona, Tucson.
- TUCKER, G.C. 1994. Revision of the Mexican species of *Cyperus* (Cyperaceae). *Systematic Botany Monographs* 432:1–212.
- TURNER, R.M., J.E. BOWERS, and T.L. BURGESS. 1995. Sonoran Desert plants: an ecological atlas. University of Arizona Press, Tucson.
- WEST, P. and G.P. NABHAN. 2002. Invasive plants: their occurrence and possible impact on the Central Gulf Coast of Sonora and the Midriff Islands in the Sea of Cortés. In: B. Tellman, ed. Invasive exotic species in the Sonoran Region. University of Arizona Press and Arizona-Sonora Desert Museum, Tucson. Pp. 91–111.
- WEST, P., J.P. REBMAN, G.P. POLIS, L.D. HUMPHREY, and R.S. FELGER. 2002. Plants of small islands in Bahía de Los Angeles. In: T.J. Case, M.L. Cody, and E. Ezcurra, eds. A new island biogeography of the Sea of Cortés. Oxford University Press, New York. Pp. 535–539.
- WATSON, S. 1889. Upon a collection of plants made by Dr. E. Palmer in 1887. *Proc. Amer. Acad. Arts Sci.* 24:36–82.